LETTERS TO THE EDITOR.

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of* NATURE. *No notice is taken of anonymous communications.*]

The Plumage Bill.

I HAVE read with much interest Sir Harry Johnston's article in NATURE of December 11 (p. 428) on the Plumage Bill proposed to be introduced next session into Parliament. I agree in the main with him that the Bill does not give as much satisfaction as was hoped for to "root and branch reformers," for it exempts from supervision personal clothing worn or imported by individuals entering this country from abroad. Consequently a woman resolved to have headdresses and robes of forbidden plumage has only to purchase such abroad and stick it into her apparel or her hat and she passes our Customs houses unchallenged.

This weakness in the Bill can surely be eliminated by making the *wearing* of wild birds' feathers in England by British subjects as illegal as the importation of the feathers. If no feathers can be introduced, it is obvious that anyone wearing them is act and part in their introduction, and the contraband is therefore subject to seizure. In any case, the Customs officers may examine any luggage suspect of concealing contraband plumes, and confiscate the feathers in the hat or dress of any subject when a law to the effect comes into force, just as they can now with any other species of contraband. It seems an absurdity to disallow the import of feathers, and yet allow them to be flaunted openly in the street. Of course, *foreign* visitors wearing feathers in England could not be legitimately interfered with; but it would be illegal for them to sell or dispose of the same in this country. Yet it would matter little if the *wearing* of plumes by British subjects were illegal. I think the American law, by which feathers worn by foreign visitors to the States, in whose country the custom is legitimate, are seized, is indefensible. It is all right when applied to its own subjects; but to foreigners it is nothing short of legalised assault and insult. How would a Maori chief, with the huia feathers distinctive of his rank in his hair, be dealt with?

Such a case as the Nipal trade could, as Sir Harry Johnston indicates, be easily blocked either at the frontier or at the Calcutta Customs House, and regulated in the same manner as the trade in opium or arms is.

As a British ornithologist, I hope Sir Harry will allow me to take exception, if I do not misunderstand him, to his charge of lukewarmness against our union in respect to this Bill. The union may contain a few opponents of the measure—they are chiefly egg-harriers—but the attitude of the great majority of its members most certainly is not that "so long as museum shelves are stuffed with specimens birds may be in the landscape or not." Only a few of the members have private collections or are museum conservators. At the last largely attended meeting of the club, a few days ago, approbation was universally extended to one of our members for having, by the expenditure of much time and with infinite patience, tried to identify by aid of his binocular a rare visitor to a certain part of England, instead of "collecting" it, which he could easily have done, and so spared himself, at the expense of a charming addition to the fortunate locality.

Is Sir Harry not rather inconsequent in asking why should there be any more killing of birds and beasts, and relegating their life-study to the camera, while reminding his fellow-ornithologists "that it is not only the skin of the bird for classification that is needed, but still more the bones, the muscles, and the viscera and the living creature itself"? I fear he cannot get these omelettes without breaking the eggs! A long series of skins is, moreover, now considered necessary for the real study of species. I may associate Sir Harry with myself as men who have collected largely, in affirming that the real scientific collector and lover of birds, who is also an exterminator of species, is a very rare person. Anyhow, over-destruction of animals for scientific purposes can be easily regulated by licence. Neither plume-hunters nor wardens can replace the scientific collector in obtaining materials for investigation.

The real object desired by the Royal Society for the Protection of Birds is the prevention of the great cruelty for which the plumage trade is responsible, of the extermination, and of the reduction towards that point of the beautiful and beneficent fauna of the world. America by her draconic law has the credit of beginning the war against extermination on effective principles. The evil must be scotched, both at the source and at the terminus of the trade. If England and her possessions prohibit the export, import, and wearing of plumes, assisted by Germany and Austria (and I understand they desire to cooperate with this country in the matter), the fashion for wearing feathers would die out notwithstanding the open market of Paris and Antwerp, and with it this nefarious trade. Where a species becomes so numerous as to cause loss to the agriculturist, it would be easy enough to give special licence for its destruction *without leave to export the skins,* for then there would be no inducement to kill more than might be necessary to "abate the nuisance." Against "discriminating reasonably" and allowing others so procured to be exported there could be no objection, if it were possible; but the Customs officers would then require to be trained ornithologists. The difficulty of determining a scheduled species is extremely difficult, and has been the cause principally of the failure of our Counties Bird Protection Bill.

All "root-and-branch reformers" in this matter are more than grateful to Sir Harry Johnston for his constant advocacy of a Bill that shall be effective to preserve the beautiful and useful animals of the world in face of the opposition of a "barbarous industry."

HENRY O. FORBES.

Redcliffe, Beaconsfield, December 14.

Intra-atomic Charge and the Structure of the Atom.

I AM very grateful to Mr. Soddy (NATURE, December 4, p. 399) that in accepting in principle the hypothesis that the intra-atomic charge of an element is determined by its place in the periodic table, he directed attention to the possible uncertainty of the absolute values of intra-atomic charge and of the number of intra-atomic electrons. Surely the absolute values depend on the number of rare-earth elements; but if to the twelve elements of this series, the international table contains between cerium and tantalum, the new elements (at least four) discovered by Auer von Welsbach in thulium (*Monatshefte für Chemie* 32, Mai, S. 373), further keltium, discovered by Urbain (*Comptes rendus d. l'Acad. des Sciences,* 152, 141–3), and an unknown one for the open place between praseodymium and samarium be added, this long period, too, becomes regular. Moreover, if only twelve instead of eighteen elements existed here, the ratio of the large-angle scattering per atom divided by M^2 is no longer constant, the values for copper, silver, tin, platinum, and gold then being 1·16, 1·15, 1·19, **1·26**, and **1·24** respectively, instead of 1·16, 1·15, 1·19, **1·17**, and **1·15**; and the same holds for the following relation concerning the number of intra-atomic electrons.

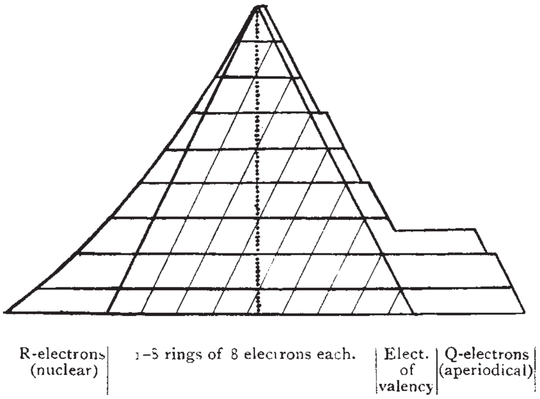
The irregularities in Mendeléeff's system—rare-earth series, complexity of group VIII., and this group, as well as group O being only half-groups—may be removed by putting hydrogen and helium (as components) outside the table, and condensing each triad of Group VIII. into one place alternating with the rare gases, and likewise all elements from cerium to tantalum into one place. For this "condensed" system, with a constant period of eight places and a constant long period of sixteen, the relation $(A-2M)/kP^2=$constant, holds as exactly, as for mean values of A, the possibility of different components taken into account, may be expected. (P is for the condensed system what M is for Mendeléeff's, and k is a constant.) If now M is the number of electrons of the negative intra-atomic charge, and A/2 (if the mass of the atom consists of α particles for by far the greater part) the total number of electrons per atom, then kP^2 must be the number of electrons, making up, together with the α particles, the positive intra-atomic charge (nuclear electrons).

	C	Mg	Ar	Cr	Zn	Kr	Mo	Cd	Xe	W	Hg	U
M... ...	6	12	18	24	30	36	42	48	54	78	84	96
P... ...	4	10	16	22	26	32	38	42	48	54	58	70
kP^2 ...	0	0	1	2	3	5	6	8	11	14	16	23
A (calc.)	12	24	38	52	66	82	98	112	130	184	200	238
A (exp.)	12	24	40	52	65	82	96	112	130	184	200	238

$$A\ (\text{calc.})=2(M+kP^2)\ ;\ k=0\cdot00468.$$

I agree with Mr. Soddy that the number of these electrons, or the components, or both, must be different for different members of the same element, and, as atomic weight, a mean value. But it seems doubtful whether other components than the α particles can be present in atoms in any appreciable amount, for of eighty-three elements no fewer than thirty-one have atomic weights of the type $4n$ (from $3\cdot51+4n$ to $4\cdot50+4n$), and twenty-nine of the type $3+4n$ (from $2\cdot51+4n$ to $3\cdot50+4n$, n being an integer), and if all radio-active substances be included (the atomic weights of the uranium family being calculated from those of uranium, radium, and lead, and actinium considered as a branch product of the uranium family), then from 114 atomic weights forty-one belong to the $4n$, fifty to the $3+4n$ series, and only twenty-three, instead of fifty-seven, to the two other types. Should particles of atomic weight one, two, three, or more, or other not being a multiple of H—for example, such as proposed by Nicholson (*Phil. Mag.*, vol. xxii., 1911, p. 871)—be mixed up with the α particles in comparable amount, then this distribution would be very improbable. Perhaps one particle of mass $\frac{3}{4}\alpha$ (J. J. Thomson's X_3?) only, is present in the $3+4n$ series, and none but α particles in the $4n$ series. Of course, other components are not impossible, but at least the members of each radio-active family must have the same components, and if actinium is a branch product of the uranium family, then here only members of the two series $3+4n$ and $4n$ are present. The periodic systems proposed previously (*Physik. Zeits.*, vol. xii., p. 490, and vol. xiv., p. 32) might then be systems not of elements, but of all possible atomic substances.

If then A/2 is the total number of electrons per atom, $kP^2=R$, that of the electrons of the intra-atomic positive charge, P that of the electrons arranged periodically, say in rings of eight electrons each, with a rest of electrons of valency, and $M-P=Q$ that of the electrons arranged aperiodically (as are the elements excluded from the "condensed" system), we get this scheme of electronic distribution, in which R is given on the left of P, and Q on the right, and the horizontal lines indicate the numbers of electrons in each and the atomic weight, while the dotted line gives the elements (each dot representing an element of the condensed system, and eight a period), and at the same time the scale for the numbers of electrons in the horizontal lines, each dot then representing one electron.



Distribution of intra-atomic electrons.

After the foregoing had been written, a letter appeared on the same subject from Prof. Rutherford (NATURE, December 11, p. 423). My letter was, indeed, not supposed by me to give any rectification of the theory of the positive nucleus as proposed by Prof. Rutherford. Nor did I suppose the idea that the nucleus might contain electrons to be new. Moreover, a cluster of α particles only may still be at the centre of the atom surrounded by some rings of electrons of a diameter smaller than $3\cdot10^{-12}$ cm. These rings may have no influence at all on the properties of the elements, and for an electron penetrating from without will belong to the nucleus, while for an electron ejected from the innermost ring they will not. So the characteristic radiation depends on M and not on A. This was proved by Moseley (*Phil. Mag.*, vol. xxvi., 1913, p. 1024; the first direct proof) to hold for the elements from calcium to zinc, but seems to hold for all. If the logarithm of μ/d(Al) be plotted against the logarithm of M, all the points lie on a straight line for the "K," and on another for the "L" radiation, the two lines being apparently parallel. The same holds for the values given by Laub (*Physik. Zeitschr.*, vol. xiv., 1913, p. 992) for the "I" radiation. The Al radiation, μ/d(Al)$=580$ cm.^{2}, g^{-1} seems to belong to still another series.

Likewise, Widdington's law holds better for $2M.10^8$ than for $A.10^8$ cm./sec., though, of course, for elements of low atomic weight the difference of M and A/2 is small; but for elements from Te upwards this difference is 20 per cent. and more.

Table II.

	Cr	Fe	Ni	Cu	Zn	Se
v min./0·995 A.10^8	0·98	**1·05**	1·05	0·99	0·98	**0·94**
M	24	26	28	29	30	34
v min./2·167 M.10^8	0·98	**1·03**	1·01	1·00	**0·98**	1·00

But the γ radiation for $M=86$ (lead, &c.) in the neighbourhood of the "L" values ranges from μ/d(Al)$=11\cdot4$ to μ/d(Al)$=85$ (Rutherford and H. Richardson, *Phil. Mag.*, vol. xxvi., p. 946), and is different for "isotopes."

Hence an electron penetrating the atom must pass the region of the "M" electrons, to excite, if of the required velocity, the outer rings of what, from a chemical point of view, might be called the nucleus, and, the radiation depending on the charge within the ring, and this charge being equal approximately to the number of electrons surrounding the ring, both will depend on M (see Bohr, *Phil. Mag.* vol. xxvi., 1913, p. 476, and Moseley, *loc. cit.*). But a β particle ejected from the innermost ring must pass all other rings, and excite radiation different for each ring and for each "isotope," as dependent on the charge within, *i.e.* on nearly A/2, on M, on P, and so on, and lose quanta of energy proportional to the square of M, P, &c. Indeed, for Ra C ("K" radiation)

$$2m.M^2.10^{16}=0{\cdot}8\times10^{13}e(M.=88),\ \text{and}$$
$$2m.P^2 10^{16}=0{\cdot}4\times10^{13}e(P=62),$$

in agreement with the quanta, calculated by Rutherford. (For these velocities $m/2V^2$ will nearly give the energy of the β particle.) Besides, the "L" radiation of Bi being about equal to the "K" radiation of As (P = 29), another quantum

$$m/2(58.10^8)^2=0{\cdot}09\times10^{13}e,$$

may be expected, and can indeed be calculated from Rutherford's tables (*Phil. Mag.*, vol. xxvi., 1913, p. 725).

But even then the nucleus might contain electrons. If the particle should, as probable, consist of 4(H+) and 2 electrons, and the particle X_3+ of 3 (H+) and 2 electrons, the number of electrons and of H+ particles should both be equal to the atomic weight. But then the diameter of the positive unit could certainly not be greater than the diameter of the electron (10^{-13} cm.), and it might, indeed, be an electron too, but in a different state, and be a particle with a net positive charge.

A. VAN DEN BROEK.

Gorssel, Holland, December 12.

Wind Provinces.

SEVERAL meteorologists have shown recently that the wind directions in the neighbourhood of cyclones and anticyclones are not of the simple nature that is sometimes supposed. Indeed it would seem that at any moment, if we consider an area large enough, the winds may be separated into distinct provinces over which they blow with great steadiness as regards direction.

Fig. 1 shows these *wind provinces* for the North Atlantic and the European and East Asiatic areas for October 25. No doubt near the surface of the earth the winds are more complex in their distribution than they are in the free air. The wind directions and isobars are taken from the Weekly Weather Report, and the long and short dotted lines separate one wind province from another. The greatest irregularities in the direction of the wind occur near mountain chains, and where rain is falling and producing local currents in the lower atmosphere.

Fig. 2 shows the wind provinces over western Europe at 8 a.m. on November 13, 1901. The wind directions shown by the arrows are from plate vii. of "The Life History of Surface Air Currents," by Shaw and Lempfert. Here we have the winds of three provinces flowing towards or influenced by the cyclonic centre. At 6 p.m. the centre had moved about one mile to the east, heavy rain fell over Europe, and the wind in the rainy area became more variable in direction. The rain of this cyclone appears to have been largely due to the wind of the south-south-westerly province bunching up against and mounting over the wind of the east-north-easterly current. Cave is of opinion that rain is very frequently the result of one wind rising over another in this manner. Thus a north-easterly wind may have an upper south-westerly rain-bearing wind blowing over it, adiabatic expansion and condensation being due to the rise of the air and only slightly to the lower pressure of the cyclonic centre.

From Fig. 1 it would appear that winds which are at the earth's surface at one place must often be upper winds at other places. Occasionally no doubt the line separating two provinces is where the wind undergoes a rather sudden change of direction under the influence of an advancing depression; for the cyclone as it advances, although it changes the direction of the wind, does not carry any particular mass of air very far from the position in which it found it. An interval of twenty-four hours is generally sufficient to alter very greatly the distribution of pressure, and, therefore, also of the wind provinces.

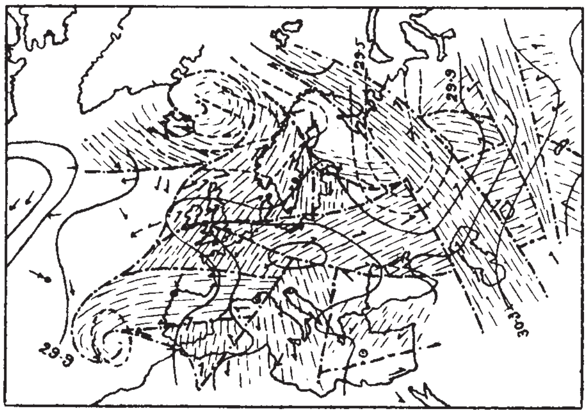


FIG. 1.—Wind Provinces, Oct. 25, 1913.

Shaw and Lempfert, in their "Life History of Surface Air Currents," have shown that the actual path of the air is not that which might be gathered from the wind charts; for the distribution of pressure and the arrangement of the wind provinces, change entirely in many cases, long before a mass of air could pass from an area of high pressure to one of low pressure. However, they prove that there is an actual rise of the air near a cyclonic centre capable of producing adiabatic expansion and the fall of rain.

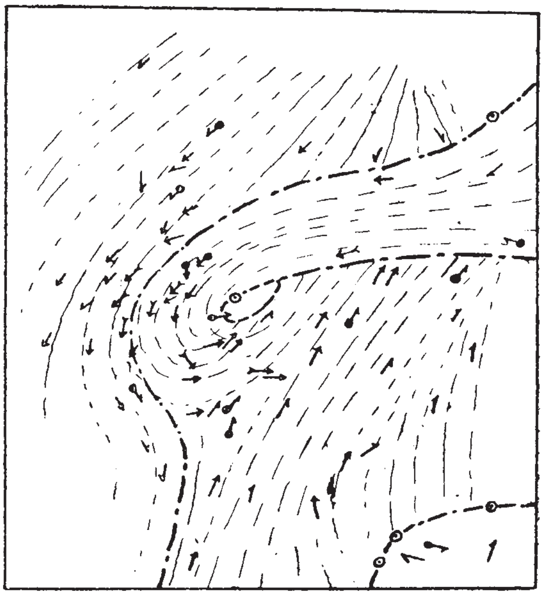


FIG. 2.—Wind Provinces, Nov. 13, 1901.